

Responses to EPA (D. Kappleman) Comments on Preliminary Volume Estimates for EPA's Partial Excavation Options West Lake Landfill OU-1

Comments on Page: 1

Comment: Total risk is cumulative. It is indeed scientifically appropriate to combine radionuclides that are elevated above background from different decay chains.

Response:

Comment noted.

Comment:

10⁻⁴ Risk for Outdoor worker using EPA defaults in the PRG calculator are:

Ra-226+D = 2.34 pCi/g

Ra-228+D = 15.3 pCi/g

Th-230 = 23,000 pCi/g

Th-232+D = 4.7 pCi/g

Response:

Comment noted; however, we are not sure what if any action needs to be taken to address this comment. EPA previously determined that for purposes of evaluation of the "complete rad removal" alternatives, the criteria to be used to define RIM would be those set forth in OSWER Directives no. 9200.4-18 and 9200.4-25; that is combined radium of 5 pCi/g above background and combined thorium of 5 pCi/g above background resulting in values of 7.9 pCi/g above background as the criteria. In response to an EPA request to evaluate a partial excavation alternative (a request that did not contain any direction or guidance on the criteria to be used to define a partial excavation alternative), the OU-1 Respondents submitted a work plan that proposed using the same criteria (i.e., 1,000 pCi/g combined radium or combined thorium and/or 500,000 cpm downhole gamma readings) that were used to define potential "hot spots" in the original Feasibility Study report (EMSI, 2006). EPA subsequently (at the September 24, 2013 meeting) asked the Respondents to provide, in EPA's words, "back of the envelope" volume estimates for three partial excavation options including (1) the criteria previously evaluated in the FS, (2) a criteria of combined radium or combined thorium of 79 pCi/g (Note: no gamma level criteria was provided by EPA), and (3) a criteria that included removal of all RIM (i.e., combined radium above 7.9 pCi/g or combined thorium above 7.9 pCi/g) located within 16 feet of the ground surface.

Comment: 79 pCi/g is not an unrestricted use criteria.

Response:

The value of 79 pCi/g¹ was selected by EPA to define one of the possible partial excavation options. It was not presented as or intended to represent an “unrestricted use” criteria. The unrestricted use criteria defined by EPA for the site is 7.9 pCi/g, although, as indicated in the text associated with the Preliminary Volume Estimates for the Partial Excavation Options and as further discussed below, the Respondents do not agree that application of the unrestricted (i.e., residential) use criteria is appropriate for a solid waste landfill.

The primary consideration raised by the preliminary volume estimate report is why an unrestricted use criteria or any multiple of an unrestricted use criteria was even being considered for West Lake Landfill, at which unrestricted (i.e., residential) use would never be allowed per the already in place permanent land use restrictions on the site and the requirements of the MDNR solid waste regulations applicable to allowable future land use at landfills.

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Comment: What is the Radiological Component Waste Acceptance Criteria for non-radiological landfills in MO where the Westlake Landfill is located. The radiological concentrations in the WestLake Landfill would not be accepted at any Municipal Landfill in any state that I am aware of.

Response:

Missouri does not have any criteria that would either allow or prohibit disposal of radionuclides in solid waste landfills. Missouri’s definition of solid waste excludes waste materials from mining, milling or smelting from the definition of solid waste RSMO Section 260.200.1(45); however, these regulations did not exist at the time the leached barium sulfate residue (LBSR) was placed at West Lake Landfill. In addition, as recognized by the USGS in their December 17, 2014 report, “Background Groundwater Quality, Review of 2012-14 Groundwater Data, and Potential Origin of Radium at the West Lake Landfill Site, St. Louis County, Missouri” (“USGS Report”), municipal landfills typically contain RIM from everyday household sources, septic sludges, construction and demolition debris, and even native soil used for daily cover. See, e.g., USGS Report at 27, 38-39. The preliminary volume estimate report was referring to regulations in other states such as Michigan and Illinois that allow for disposal of contaminated soil in municipal solid waste (MSW) landfills containing Ra-226 concentrations that do not exceed 100 pCi/g or up to 200 pCi/g with the submittal of additional documentation.

Comment: Why are the estimates not as definitive as volume estimates in the SFS since the same data was available for the estimates?

¹ At the September 24, 2013 meeting, EPA indicated that the 79 pCi/g level was selected by EPA because it is 10 times the unrestricted use criteria previously identified by EPA for the “complete rad removal” alternatives based on the criteria presented in OSWER Directives no. 9200.4-18 and 9200.4-25.

Response:

The same data were used for the preliminary volume estimates as was used for the prior detailed evaluation of the "complete rad removal" alternatives. The difference between the two is the level of detail and the procedures used. As discussed during the recent January 23, 2015 meeting, EPA requested that only approximate volume estimates be developed for each of the three possible partial excavation options identified by EPA. Specifically, during a September 24, 2013 meeting to discuss EPA comments on the various work plans for the additional SFS evaluations, EPA requested "back-of-the-envelope" (i.e., preliminary engineering) estimates of the volumes associated with three possible partial excavation options identified by EPA be prepared. The objective was to provide information on the relative volumes associated with each of the three options identified by EPA to assist EPA in selection of one option for detailed evaluation in the Supplemental SFS at which point a more detailed volume estimate can be prepared. EPA specifically indicated at the September 24, 2013 meeting that it did not want the Respondents to prepare detailed estimates but rather only wanted preliminary, what EPA termed "back of the envelope"-level estimates. Preparation of detailed estimates of the volumes associated with any excavation scenario require extensive evaluations of the volumes of overburden, volumes of waste considered for excavation and development of detailed cut and fill and grading plans all of which requires extensive effort, time and cost and thus is only appropriate for detailed evaluations such as those presented in the SFS and are thus inconsistent with the preliminary estimates specifically requested by EPA.

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Comment: An efficiency determination of the probe that was utilized for down-hole gamma logging should have been compared with laboratory data to determine what count rate would be roughly equivalent to 6,000 cpm.

Response:

A tabulation and comparative correlation of the downhole gamma readings in counts per minute (cpm) to the radionuclide analytical results for samples obtained from the boreholes was included in both the Remedial Investigation (RI) and the SFS reports. A direct correlation between the two types of data is limited by the fact that the depth intervals for the samples submitted for laboratory analyses were prescribed by the approved RI/FS Work Plan (the soil samples were obtained at prescribed 5-foot depth intervals during bucket auger drilling of the RI soil borings which were subsequently downhole logged after the soil boring reached its total depth and thus soil samples were not necessarily obtained from the exact depth where the peak gamma readings were obtained).

Comment: Drawings should include the Figure 1-3 Soil boring locations from the West Lake Landfill OU-1 Remedial Investigation Report just before Appendix B-2.

Response:

Figures showing the locations of the soil borings were included in both the SFS report and the RI report; however, such figures can also be included as part of the preliminary volume estimates for the partial excavation options if EPA determines that a revised preliminary volume estimate report is necessary. We have included

such figures with these responses to comments in conjunction with our responses to some of the other comments provided by EPA (please see the attached Figures 1 and 7).

Comment: The assumption being made by the scenarios "assume" that all areas between contaminated sampling points are also contaminated within the gray shaded area are above the "Scenario Concentrations". Additional measurements and sampling will need to be performed to confirm the actual footprint.

Response:

It is correct that the assumption made for all three scenarios is that the waste materials between locations that contain RIM above the prescribed levels also contain RIM above the prescribed levels. This is the same assumption that was used to develop the volumes for the "complete rad removal" alternatives in the SFS report (EMSI, 2011). It is also the same assumption that was used during preparation of the earlier FS report (EMSI, 2006), the RI report (EMSI, 2000) and that was also used by the Nuclear Regulatory Commission (NRC) in its evaluation of the extent of radionuclide occurrences at the site (NRC, 1988 and RMC, 1982). This assumption is considered appropriate for the following reasons:

1. Although the spacing between the soil borings in some parts of the site may appear large, the locations of the RI soil borings were based on use of a stratified random sampling grid which incorporate both random and biased sampling points (McLaren Hart, 1996a and 1996b). The earlier NRC investigation also used a grid-based approach to collection of samples (NRC, 1988 and RMC, 1982).
2. Use of this type of assumption is supported by other data such as the results of the overland gamma survey which indicate that gamma levels greater than background or in many areas greater than two times background (McLaren Hart 1996a Figure 3-9 and EMSI, 2000 Figure 4-6 for example). The presence of elevated gamma levels in the areas between the borings is also supported by the results of the NRC overland gamma surveys (RMC, 1982 Figures 3 and 4 for example).

We have assembled a series of figures (many of which were provided in previous reports for the site or that represent combinations of information provided on figures included in previous site documents) that overlay the locations of the RI and NRC borings with the results of the RI overland gamma survey (Figures 1 – 12). These overlays clearly indicate that although in some areas the borings may be spaced a few hundred feet apart, the likely presence of RIM in between these borings is supported by the results of the overland gamma survey and the understanding of the method of LBSR disposal. We have also attached Figure 12 from the SFS report which presents overlays of the results of the NRC, RI and SFS evaluations of the extent of RIM occurrences at the site. This figure demonstrates how all three of these evaluations independently arrived at extremely similar estimates of the extent of RIM in Areas 1 and 2.

As was discussed during the January 23, 2015 meeting, the suggestion that additional characterization of Areas 1 and 2 may need to be performed was based on a misunderstanding of the intended use of the preliminary volume estimates and the methodology used to develop such estimates. Once these were clarified, EPA determined that additional measurements and sampling were not necessary. Based on discussions during a

January 30, 2015 meeting at EPA, we understand that EPA may be reconsidering the need for additional investigation of Areas 1 and 2 although EPA has not yet provided a specific reason or rationale why any such additional investigations may be necessary.

Additional measurements and sampling to confirm the actual footprint of the RIM are unnecessary because:

- a. Sufficient information already exists to select a remedy for the site;
- b. Sufficient information already exists to develop and evaluate a partial excavation alternative if EPA determines that such an evaluation is necessary;
- c. Even if an excavation alternative were to be implemented, the decision regarding the need for additional measurements and sampling would be a value engineering evaluation that would compare the engineering value, costs, and schedule impacts of several options such as:
 - i. Detailed sampling and analyses to further define the lateral and vertical extent and volume of material to be excavated during remedial design prior to implementation of any remedial action; versus
 - ii. Sampling and analyses performed during excavation to guide the excavation activities and verify that the remaining materials meet the criteria to be established by EPA for leaving material onsite; versus
 - iii. Simply excavating the prescribed area and volume and collecting confirmatory samples to verify that the remaining materials meet the criteria to be established by EPA for leaving material onsite.
- d. It should be noted that based on the nature of the placement of the LBSR (used as daily and intermediate cover material) and the subsequent 40 years of decomposition, settlement and consolidation of the waste materials, the distribution of RIM within the waste mass is expected to be highly heterogeneous and discontinuous along the margins of the areas containing RIM. Consequently, the amount of additional measurements and sampling necessary to verify the footprint of the RIM could be excessive and the cost and time required for such characterization could outweigh the ultimate value. This is particularly true given the likely need to perform verification and confirmation sampling during any excavation activities if a partial excavation, or any excavation, alternative were to be implemented at the site.

In addition, the need for and possible scope of additional investigations of RIM occurrences for evaluation of possible partial excavation options cannot be assessed until EPA identifies which, if any, of the partial excavation options it will direct for inclusion in the Supplemental SFS report. Each of the three options identified by EPA are based on substantially different criteria. Consequently, the scope of any investigations that might be performed to provide additional data for the evaluation of a partial excavation alternative are dependent upon the criteria used to define such an alternative. A similar but even more divergent issue exists if we were to attempt to identify additional boring locations for the three partial excavation options identified by EPA.

Furthermore, use of a statistically based sampling approach as suggested in EPA's comments, requires definition of a cleanup standard, in this case the criteria to be used to define a partial excavation alternative and define how the cleanup standard should function (e.g., a value that should be rarely exceeded or an average value). Use of a statistically-based sampling design also requires identification of a decision unit size that is the smallest volume of soil about which a decision will be made. Once the decision unit is defined, the size of the smaller sampling units can be evaluated. Explicit and appropriate definition of the decision unit is a key component to development of statistical based sampling design. Until EPA selects a particular partial excavation option for further evaluation, the need for or possible scope of any additional investigations cannot be defined.

Lastly, EPA's position that additional sampling may be needed to evaluate possible partial excavation options is contrary to EPA's previous determination that sufficient sampling data existed to evaluate the "complete rad removal" alternatives. The previous characterization level was considered appropriate. There is no fundamentally new data or site understanding that drives a need for reconsideration.

Comment: Why wasn't all of the recent investigation data included as well?

Response:

The results of the recent Phase I Gamma Cone Penetrometer Test (GCPT) investigation had not been assembled and reported at the time the preliminary volume estimates for the partial excavation options were prepared. In any event, it was anticipated that further investigations would be performed and therefore integration of the Phase I GCPT investigation results, even if they had been available, into the evaluation would only have been an interim step that would have to be redone once the results of the additional investigations were completed. Therefore, such an effort would have been inconsistent with EPA's request for only preliminary estimates of the volumes of RIM associated with the three partial excavation options identified by EPA.

More importantly, inclusion of the Phase I GCPT investigation data in the development of the preliminary volume estimates for the partial excavation options would have negated the ability to compare the volume estimates to the estimates of the volumes of RIM included within the scope of the "complete rad removal" alternatives because these volume estimates would have been based on different data sets.

Furthermore, it is likely that the additional data from the Phase I GCPT investigation (or any additional data developed in any potential additional investigations) would only have a minimal impact on the volumes associated with the options. Specifically,

1. The results of the recent testing identified only one location with radium/thorium greater than 1,000 pCi/g and consequently would only have a minimal impact on the volume associated with 1,000 pCi/g partial excavation option;
2. Only a few locations with levels greater than 79 pCi/g were found and thus would only minimally affect the volume associate with this option (Note: most of these occurrences were located at substantial depths below the overlying North Quarry Landfill and as such are similar to the deeper points previously identified in Area 2 for which EPA has requested an alternative volume estimate based on exclusion of the deeper points); and

3. Overall the additional RIM occurrences identified by the Phase I investigation primarily occurred at depths greater than the 16-foot depth cutoff criteria selected by EPA for the third partial excavation option and as such would not affect the volume of material included in this option.

It is anticipated that all of the data from the Phase I investigation, and from any other additional investigations that may be performed, will be included and incorporated into the evaluations presented in the Supplemental SFS.

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Comment: Misunderstanding of intent of Scenario. Most of the soil is on the surface, but can exclude volumes below 16 ft and only remove contaminated soil above 16ft, but not all soil.

Response:

The evaluation of the 16-foot depth option did not presume or include removal of all soil above the 16-foot depth cutoff, rather per EPA direction at the September 24, 2013 meeting, this option only includes removal of soil located above the 16-foot depth criteria that contained combined radium or combined thorium greater than 5 pCi/g above background (i.e., combined radium or combined thorium greater than 7.9 pCi/g) as per the criteria EPA established for the "complete rad removal" alternatives per the OSWER guidance.

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Comment: Additional sampling will be required to determine footprint and volume around previously identified contaminated areas.

Response:

As was discussed at the January 23, 2015 meeting, additional sampling is not required. Further discussion relative to possible additional sampling is provided above in the response to third comment on page 3 of the report.

Comments on Page: 8

Comment: From this paragraph it sounds like additional data collection is necessary to determine at what level bgs the RIM is **currently** located at.

Response:

As was discussed and agreed at the January 23, 2015 meeting, additional sampling is not required. Sufficient data are available to evaluate possible alternatives and to select a remedy for the site and thus no additional data are required. The text was merely pointing out one possible uncertainty related to the information available for preparation of a preliminary volume estimate for the 16-foot depth option. Additional topographic

data has been obtained since the time the SFS was prepared and will be included in the evaluations of the grading plans for the ROD-selected remedy, the “complete rad removal” alternatives, and if necessary a partial excavation alternative during preparation of the Supplemental SFS report.

The point of the discussion presented in the text of the preliminary volume estimates report is that although the EPA-requested 16 foot depth criteria was utilized to estimate the volume of RIM that would be included in this partial excavation option, the actual depth that would need to be considered if such an option were to be evaluated further would be greater than 16 feet in some areas due to placement of additional inert fill over portions of Areas 1 and 2 since completion of the RI investigations. The estimated volume for the 16-foot depth option presented in the report is correct within the limits of a preliminary engineering estimate because it was based on use of the 2005 topographic surface which pre-dates the placement of the additional inert fill material. However, if such an option were to be selected, additional definition and evaluation of the depth criteria would need to be performed to adjust the depth for the change in surface elevations over the intervening years so as to include the same types and amounts of materials that EPA envisioned to be included in the 16-foot depth option.

Path Forward:

EPA indicated that the purpose of preparation of the preliminary (“back of the envelope”) volume estimates for the three partial excavation options was to provide EPA information for selection of a partial excavation alternative to be evaluated in the Supplemental SFS. EPA’s comments on the preliminary volume estimates for the partial excavation options identified by EPA do not indicate which option, if any, EPA wants to be evaluated in the Supplemental SFS. We will await that direction before proceeding with additional work relative to this work plan.

References

Engineering Management Support, Inc. (EMSI), 2011, Supplemental Feasibility Study, West Lake Landfill Operable Unit 1, December 28.

EMSI, 2006, Feasibility Study, West Lake Landfill Operable Unit 1, May 9.

EMSI, 2000, Remedial Investigation, West Lake Landfill Operable Unit 1, April 10.

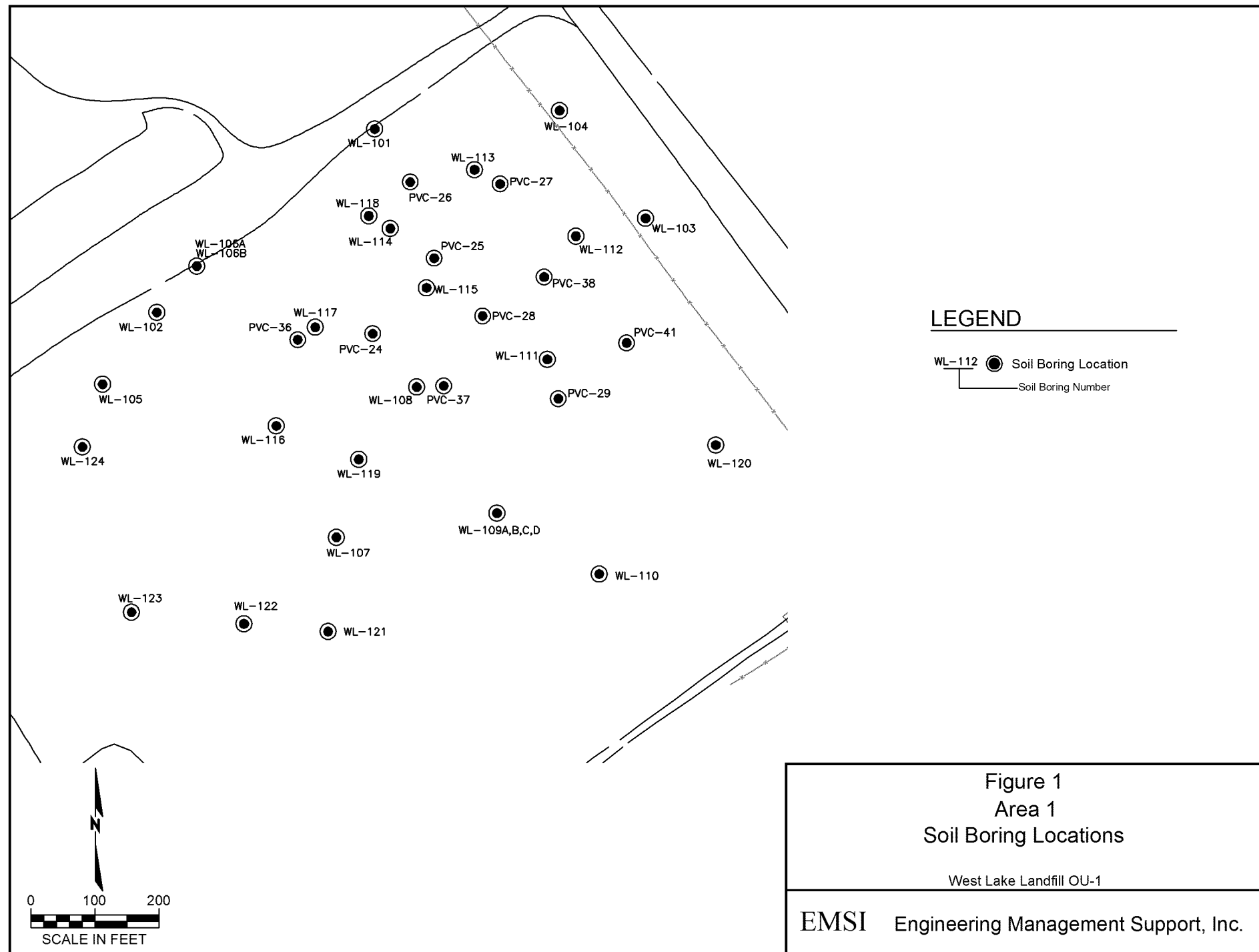
Feezor Engineering, Inc., 2014, Bridgeton Landfill Thermal Isolation Barrier Investigation Phase I Report, Bridgeton, St. Louis County, Missouri, December 19.

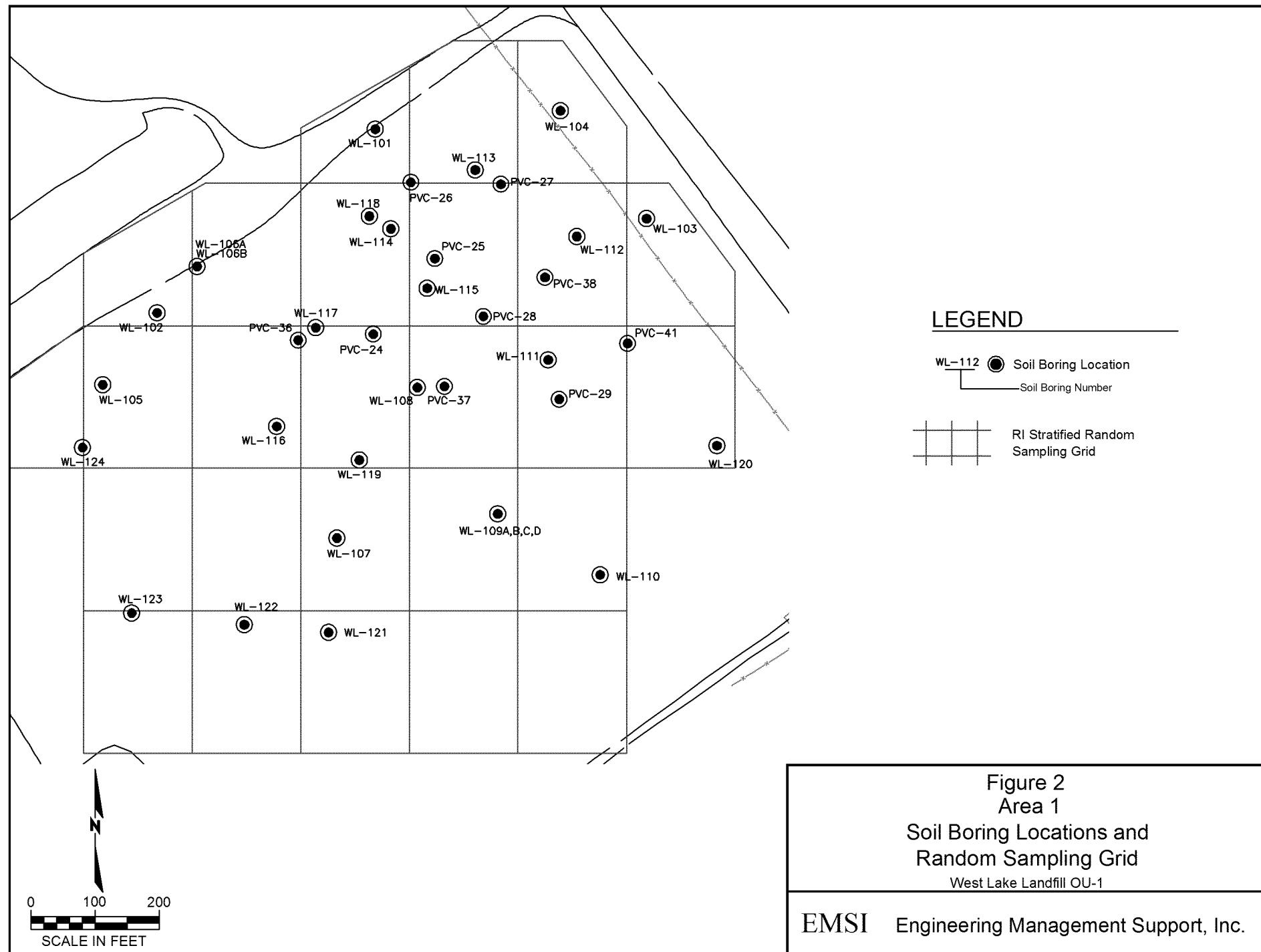
McLaren hart, 1996a, Overland Gamma Survey Report, West Lake Landfill Radiological Areas 1 & 2, April 30.

McLaren Hart, 1996b, Soil Boring/Surface Soil Investigation Report, West Lake Landfill Areas 1 & 2, November 26.

Nuclear Regulatory Commission, 1988, Radioactive Material in the West Lake Landfill, Summary Report, NUREG-1308 Rev. 1, June.

Radiation Management Corporation, 1982, Radiological Survey of the West Lake Landfill, St. Louis County, Missouri, NUREG/CR-2722, May.





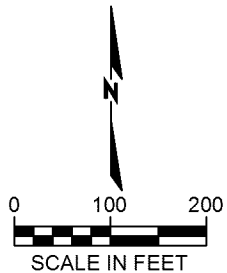
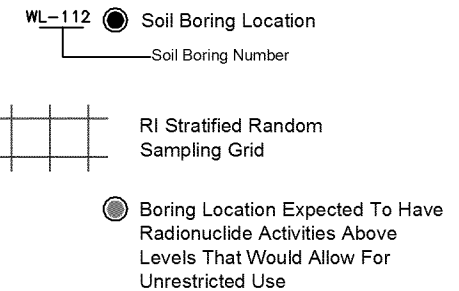


Figure 3
Area 1
Boring Locations with Radionuclide Activities
above Unrestricted Use Levels
West Lake Landfill OU-1

EMSI Engineering Management Support, Inc.

